

Wind Forecast Verification during Bora Events at the Dubrovnik Airport

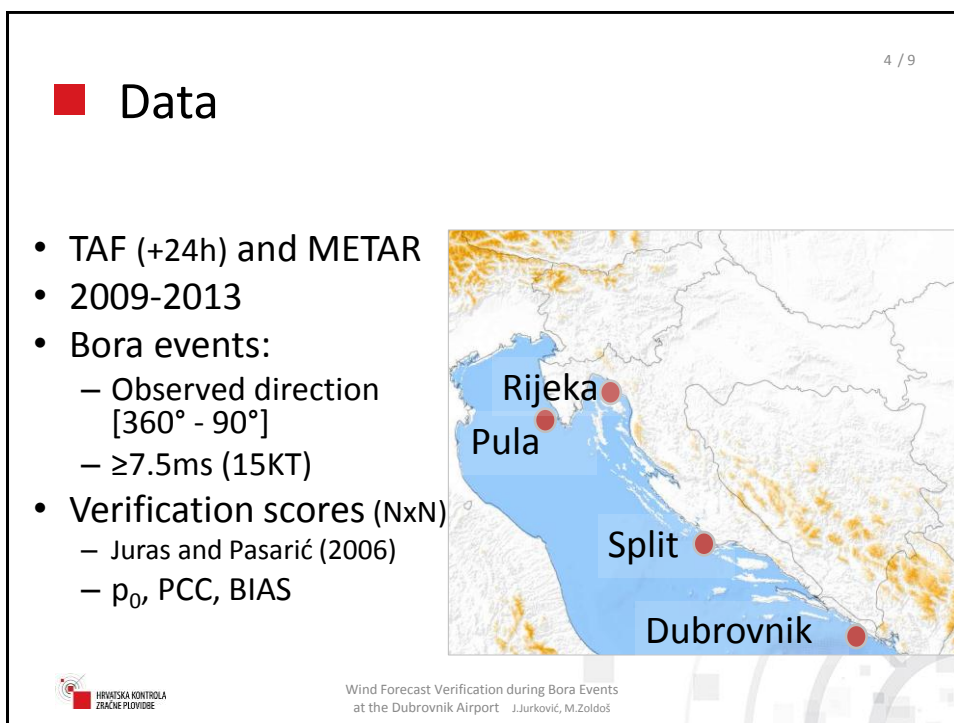
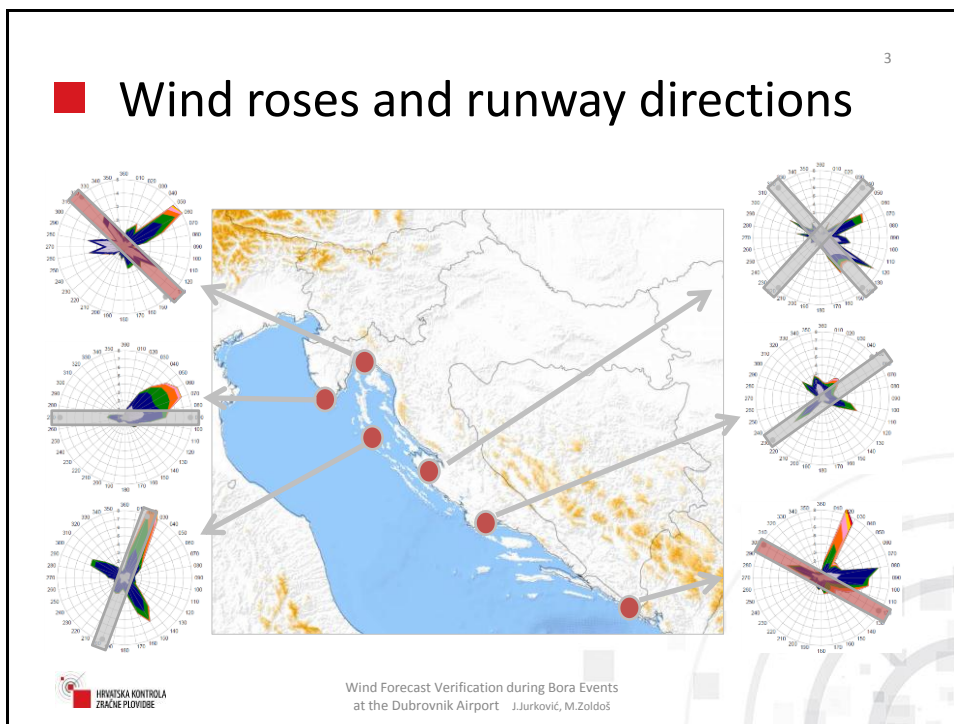
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Marko Zoldoš

Workshop on advances in meso- and micro-meteorology
3-4th November 2014

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■ Introduction

- Part of Quality Management System (ICAO Annex 3)
- Diagnostic verification => Forecast improvements
 - Verification of special problems for aviation in Croatia
 - Convection (TS)
 - Fog (reduced visibility)
 - Wind (especially bora events)
- Bora: large/meso/micro - scale
 - Lee side of Dinaric Alps
 - Severe events reduce aviation operation
 - Gusts, turbulence, wind shear



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■ Method

- Similar to Austrocontrol verification system, Mahringer (2008)
- TAF, two basic principles
 - forecast for time periods
 - contains a range of forecast condition
- Verify the conditions between forecast and observation for each hour.
 - NxN contingency tables



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■ Example 1

- Airport: LDPL
- TAF: 20.01.2011. 11 UTC
- LDPL 201100Z 2012/2112 05020G30KT 9999 SCT050=
- Steady bora flow

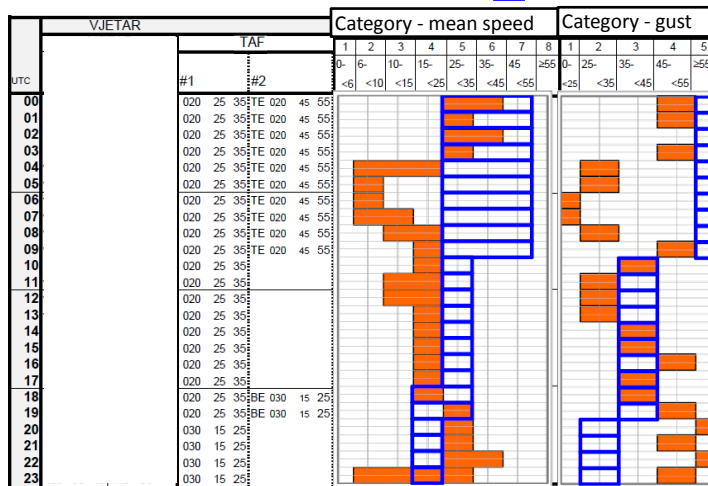


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Example 2 - Eyeball verification

■ OBSERVATION-METAR

□ FORECAST - TAF



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Results 1

Contingency tables Dubrovnik bora hour

Maxima

FCST \ OBS	0	1	2	3	SUM	Rel.freq.
0	39319	7882	1254	87	48542	64,2%
1	14649	6683	1489	73	22894	30,3%
2	2124	1152	583	16	3875	5,1%
3	>=17,5	157	51	33	241	0,3%
SUM	56249	15768	3359	176	75552	
Rel.freq.	74,5%	20,9%	4,4%	0,2%		

Minima

FCST \ OBS	0	1	2	3	SUM	Rel.freq.
0	46199	7139	931	54	54323	71,9%
1	13683	4796	1029	41	19549	25,9%
2	947	443	279	0	1669	2,2%
3	>=17,5	7	4	0	11	0,0%
SUM	60836	12382	2239	95	75552	
Rel.freq.	80,5%	16,4%	3,0%	0,1%		

Class boundaries [m/s], 2009-2013

- Diagonal ±1 class

	Pula	Split	Dubrovnik
	98%	99%	95%

- Within forecast range

	Pula	Split	Dubrovnik
	82%	85%	66%

- Bias

	Pula	Split	Dubrovnik
MAX>7.5	2,0	3,0	1,4
MAX>12.5	2,2	2,5	1,2



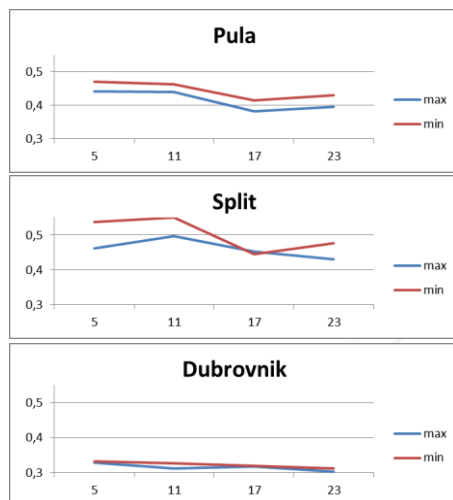
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Results 2 – issue time

PCC- wind speed

Forecasters in charge

- 5, 11 => in-situ
- 17,23 => allocated



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Results 3 – W.speed $\geq 25KT$

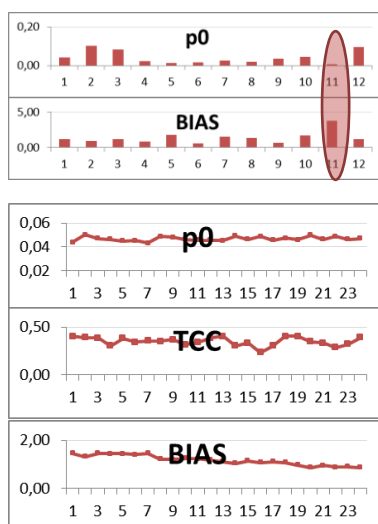
Severe bora:

-MONTHS

-LEAD TIME

Association \sim const

Bias=> better in second part of forecast

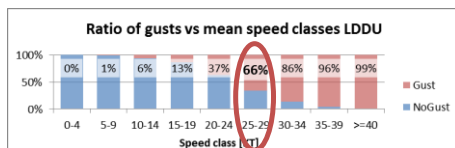


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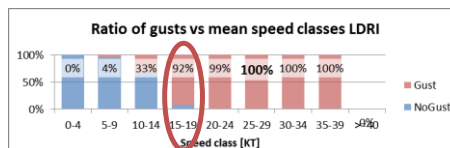


■ Gusts (≥ 10 KT mean)

South Adriatic (LDDU)



North Adriatic (LDRI)



Typical METAR **dddffGggKT** (direction, mean, gust)

02015KT

05015G30KT

02020KT, (02020G32KT)

~~02020KT~~, 02020G38KT

02030G40KT,

02030G55KT

- Different features and „gustiness factor”



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■ Conclusion

- Results for severe bora flow
 - Overall good results
 - Better scores for Pula and Split then Dubrovnik
- Lead time: PCC nearly constant, bias decreasing
- Forecaster
 - Better scores from in-situ
- Flow regime should be more analysed:
 - Deep, shallow, gap flow

THANK YOU



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